Airborne Particulate Threat Assessment

DE-FC26-05NT42594

Q2 Quarterly Review

Period From 1-Jan-06 to 31-Mar-06

May 2, 2006

ChemImage Corporation

Meeting Agenda

Attendees: Donald Martello, William Aljoe (DOE NETL)

Patrick Treado, Thomas Voight, Oksana Klueva,
Jeffrey Beckstead, Chuck Gardner (ChemImage)

3:00 Welcome

3:10 NETL Comments

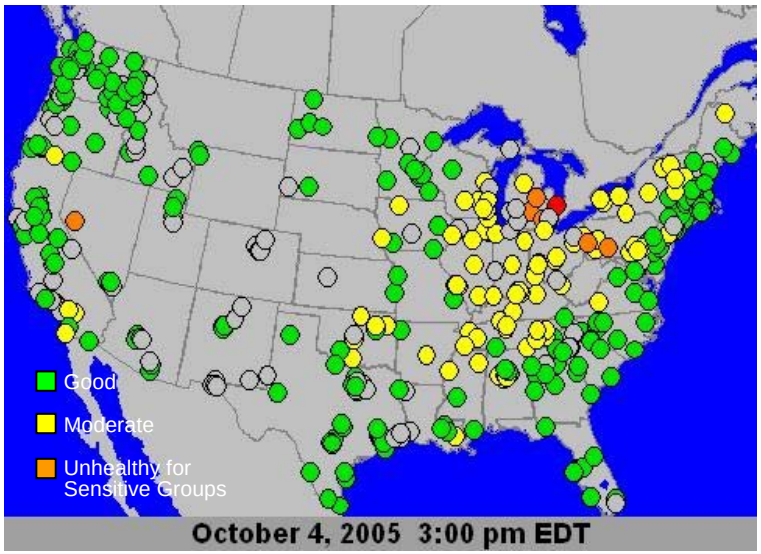
3:40 Q2 Program Review

- NETL Subcontract Status
- ChemImage Task Status

4:40 Wrap-up

Airborne Particulate Threat Assessment (APTA)

DOE-ChemImage-QC40160R; Award DE-FC26-05NT42594
ChemImage Corporation, 7301 Penn Avenue, Pittsburgh, PA 15208
PI: Patrick Treado, Tel (412)241-7335, Fax (412)241-7311, email: treado@ chemimage.com



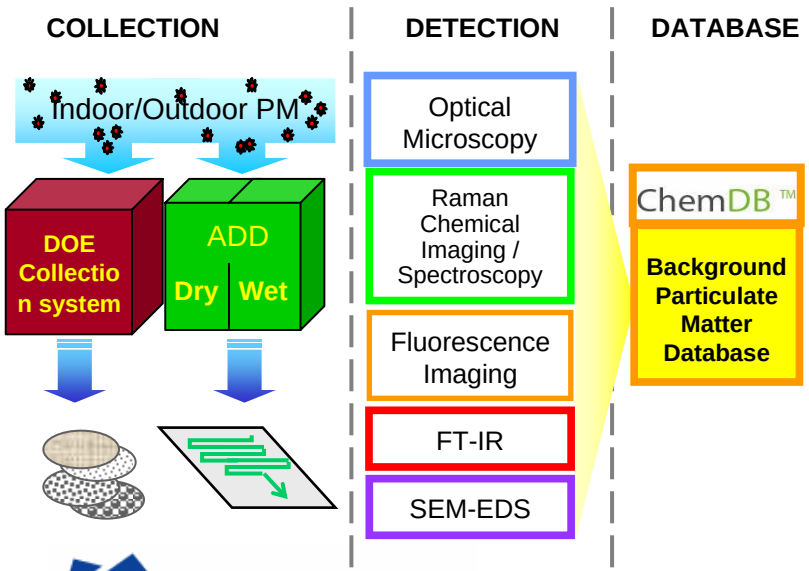
Airborne Particle Threat Assessment Program Overview

Objective: To advance the state of our knowledge of ambient background PM composition, with a view toward acquiring the ability to discern between the chemical/biological threat agents and ambient background PM encountered in the environment at the time of the threat agent detection.

Description: The APTA Project will accelerate the development and validation of Raman Chemical Imaging for the autonomous detection of airborne chemical and biological hazards in the environment. In collaboration with the National Energy Technology Laboratory (NETL), ChemImage will undertake a comprehensive assessment of background airborne particulate threat levels in *Western Pennsylvania,* enabling improvements in ChemImage's ongoing airborne threat detection technology.

ChemImage's FALCON II™ molecular chemical imaging systems will be used to demonstrate the high sensitivity and low false alarm potential of the technology for airborne threat detection.

Phase I Duration: 12 months
Cost: $1.794 M Start: October 1, 2005



Tasks	Performer	Milestones	Deliverables
1 Assessment and Setup		M1 Complete Task 1	Literature review report
1.1 Assessment of existing knowledge base	CI/NETL		Particle laboratory setup plan
1.2 Setup and qualify ambient particulate collection equipment at CI and DOE ambient particulate collection equipment			
1.2.1 ChemImage Setup	CI		
1.2.2 DOE Setup	NETL		
2 Automated Deposition System Development		M2 Qualify ADD	ADD test report
2.1 Investigate properties of system candidate components	CI		
2.2 Design Automated Deposition Device (ADD)	CI		
2.3 Fabricate & Test ADD	CI		
3 Collection of Ambient Background Samples		M3 Complete 1st Seasonal Particulate Collection	ADD validation testing report
3.1 Collect full data sets on pure components - predeposition	CI/NETL		
3.2 Periodic collection of outdoor, ambient airborne particulate	CI/NETL		PM collection report
3.3 Periodic Collection of indoor, ambient airborne particulate	CI/NETL		
4 Detection			
4.1 Analyze collected particulate matter (PM)	CI/NETL		
5 Signature Database Compilation		M4 Complete remainder of Tasks 3, all of 4 and 5	PM signature analysis report
5.1 Compile a database of signature data sets	CI		PM signature database effort report
6 Final Report	CI/NETL	M5 Complete Task 6	Final report on project accomplish-ments, including test and validation results
Task 6.1: Write final report			

Figure 3

Tasks, Milestones, Deliverables

Tasks	Performer	Milestones	Deliverables
1 Assessment and Setup 1.1 Assessment of existing knowledge base 1.2 Setup and qualify ambient particulate collection equipment at CI and DOE ambient particulate collection equipment 1.2.1 ChemImage Setup 1.2.2 DOE Setup	CI/NETL CI NETL	**M1** Complete Task 1	Literature review report Particle laboratory setup plan
2 Automated Deposition System Development 2.1 Investigate properties of system candidate components 2.2 Design Automated Deposition Device (ADD) 2.3 Fabricate & Test ADD	 CI CI CI	**M2** Qualify ADD	ADD test report
3 Collection of Ambient Background Samples 3.1 Collect full data sets on pure components – pre-deposition 3.2 Periodic collection of outdoor, ambient airborne particulate 3.3 Periodic Collection of indoor, ambient airborne particulate	 CI/NETL CI/NETL CI/NETL	**M3** Complete 1st Seasonal Particulate Collection	ADD validation testing report PM collection report
4 Detection 4.1 Analyze collected particulate matter (PM)	 CI/NETL		
5 Signature Database Compilation 5.1 Compile a database of signature data sets	 CI	**M4** Complete remainder of Tasks 3, all of 4 and 5	PM signature analysis report PM signature database effort report
6 Final Report Task 6.1: Write final report	CI/NETL	**M5** Complete Task 6	Final report on project accomplish-ments, including test and validation results

APTA Project Schedule

Task Name	Duration
Task 1: Assessment and Setup	**6 months**
1.1 Assessment of existing knowledge base	5 month
1.2 Setup and qualify ambient particle collection equipment	84 days
1.2.1 ChemImage Setup	84 days
1.2.2 DOE Setup	84 days
Task 2: PM Sample Collection and Analysis Systems	**8 months**
2.1 Automated Deposition Device (ADD) System	5 months
2.2 Ambient Particulate Integrated Collector and Detector (APICD)	6 month
Task 3: Collection of Ambient Background Samples	**10 months**
3.1 Collect full datasets on pure components - pre-deposition	10 months
3.2 Periodic collection of outdoor, ambient airborne particulate	10 months
3.3 Periodic collection of indoor, ambient airborne particulate	10 months
Task 4: Detection	**10 months**
4.1 Analyze collected particulate matter	10 months
Task 5: Signature Database Development	**10 months**
5.1 Enhance ChemDB signature database	10 months
5.2 Compile Database of Signature Data Sets	10 months
Task 6: Final Report	**1 month**

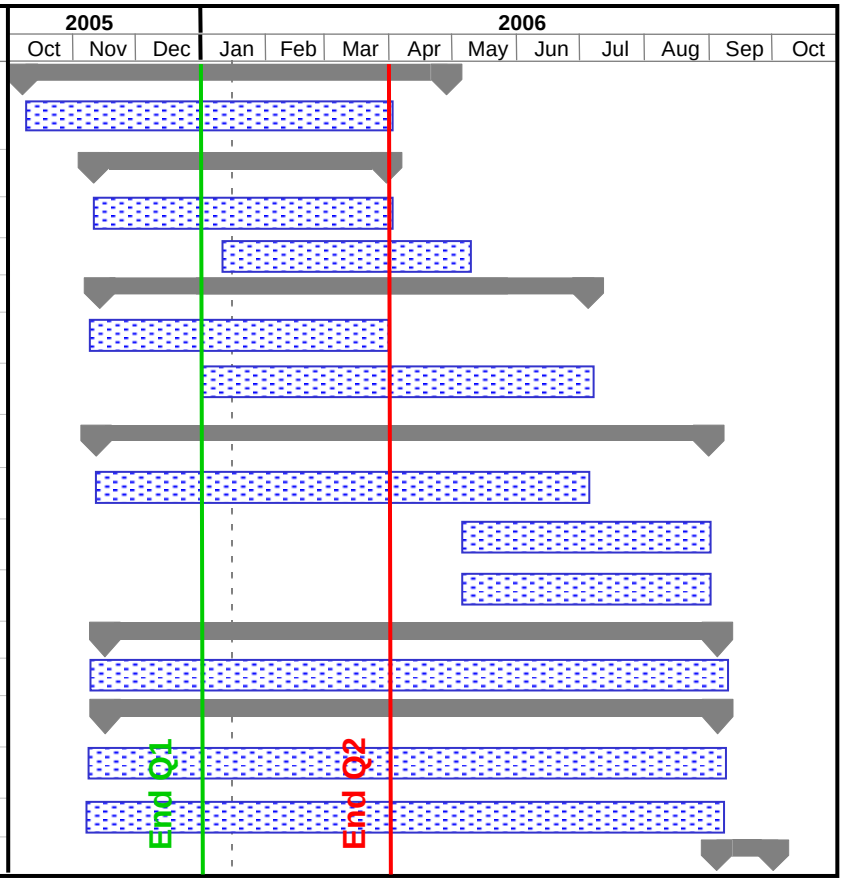


Figure 5

Deliverables and Meetings Schedule

Meetings:

- Kick-off Meeting
  - November 14, 2005
- Quarterly Review Meetings
  - Q1: February 8, 2006
  - Q2: May 2, 2006
  - Q3: July, 2006
- Final Meeting (Q4)
  - TBD, after the delivery of Final Report

Deliverables:

- Quarterly Reports
  - Q1 ended 31-Dec-05,
    Q1R submitted 31-Jan-06
  - Q2 ends 31-Mar-06,
    Q2R submitted 28-Apr-06
  - Q3 ends 31-Jun-06,
    Q3R due 31-Jul-06
  - Q4 ends 31-Sep-06,
    Final report due 90 days after project date
- Other Reports
  - Particle Laboratory Setup Plan
    – Submitted 31-Jan-06
  - Literature Review Report
    – Submitted 31-Mar-06
  - ADD Test Report - 19-May-06
  - ADD Validation Testing Reports - 31-Jul-06
  - PM Collection Report - 31-Aug-06
  - PM Signature Analysis Report - 31-Aug-06
  - Database Signature Report - 31-Aug-06

Project Workflow

COLLECTION

Outdoor Particulate Matter

Indoor

Threat Simulant

DOE Collection system

ADD

Dry | Wet

Mixing Chamber

Batch Mode Manual Deposition

Continuous, Time-Correlated Automatic Deposition

DETECTION

Optical Microscopy

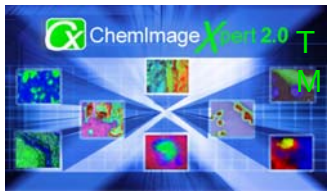
Raman Chemical Imaging / Spectroscopy

Fluorescence Imaging

FTIR

SEM-EDS

DATABASE



Background Particulate Matter Database

ChemImage Xpert 2.0

CI Present™

ChemDB™

ChemImage

Figure 7

Q2 Technical Progress – Task Summary

(1-Jan-06 – 31-Mar-06)

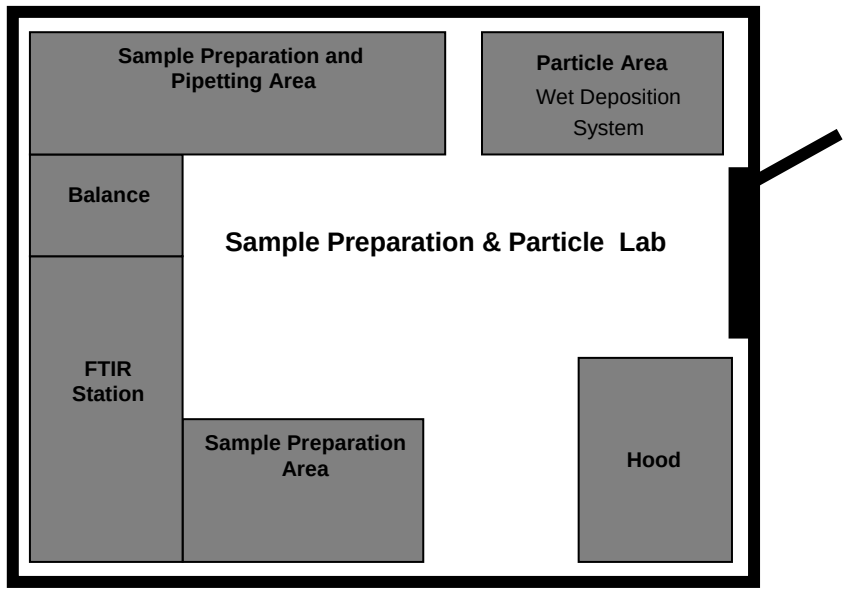
#	Task Description	% Completed	
		Planned*	Actual
1	Assessment & Setup	85%	85%
2	Automated Deposition System Development	63%	50%
3	Collection of Ambient Background Samples	50%	25%
4	Detection	50%	15%
5	Signature Database Compilation	50%	15%
6	Final Report	0%	0%

* Planned percentage completion is based on calendar schedule

Task 1: Assessment and Setup

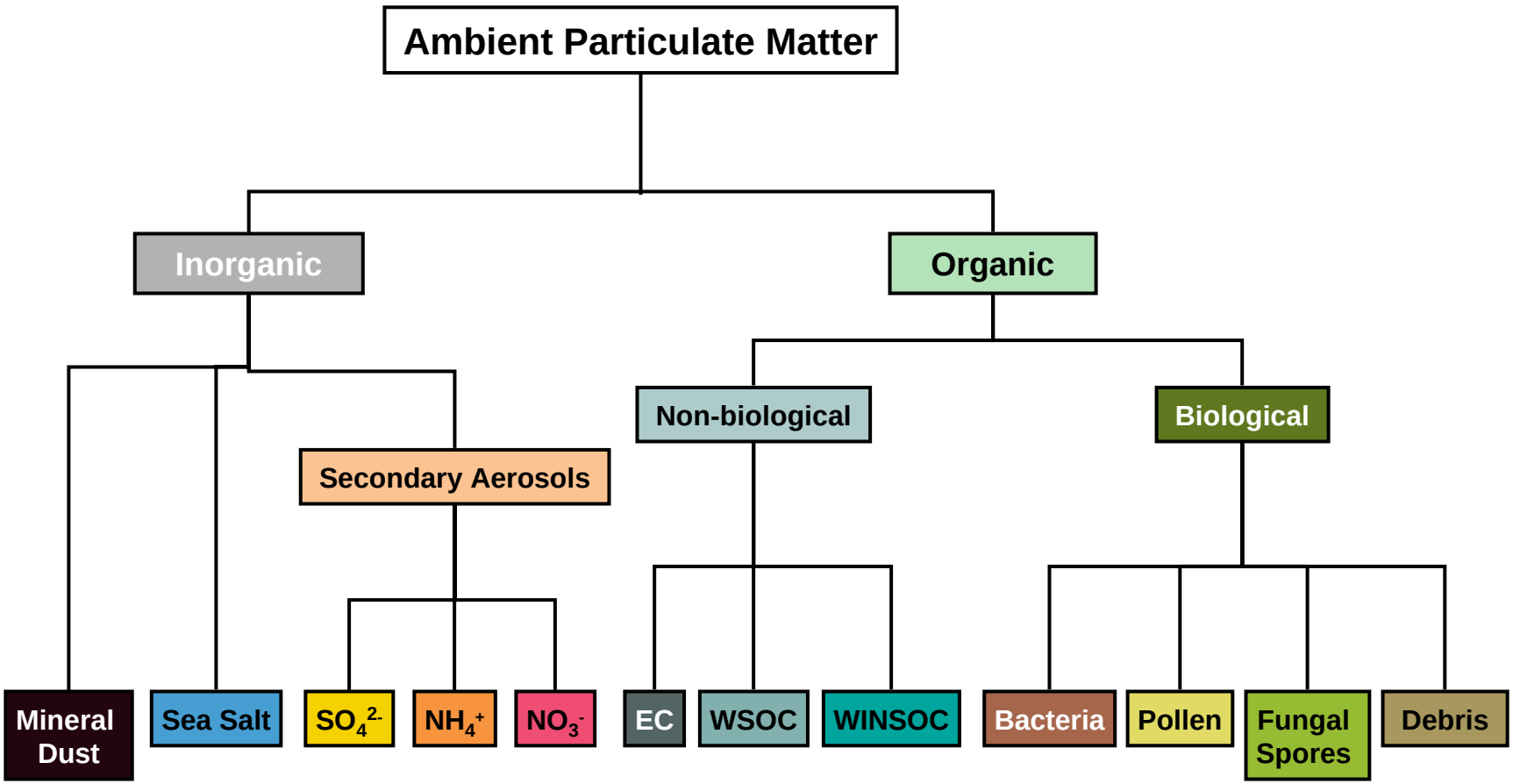
Task 1	Assessment & Setup of PM Collection Equipment	Planned	Actual
	Task 1 Completion	**85%**	**85%**
1.1	Assessment of knowledge base	100%	100%
1.2	Setup and qualify PM collection equipment	100%	50%
1.2.1	ChemImage lab setup	100%	100%
1.2.2	DOE lab setup	100%	0%

- Literature review is 100% complete, additional references are being collected to fill identified knowledge gaps
- ChemImage Particle Lab Setup is finished
  - Equipment was purchased and is being qualified
  - Formal microscopy training is arranged for May 31 – June 2, 2006
- PM collection and training on DOE NETL equipment has been delayed



Task 1.1: Assessment of Knowledge Base

Classification of Ambient PM



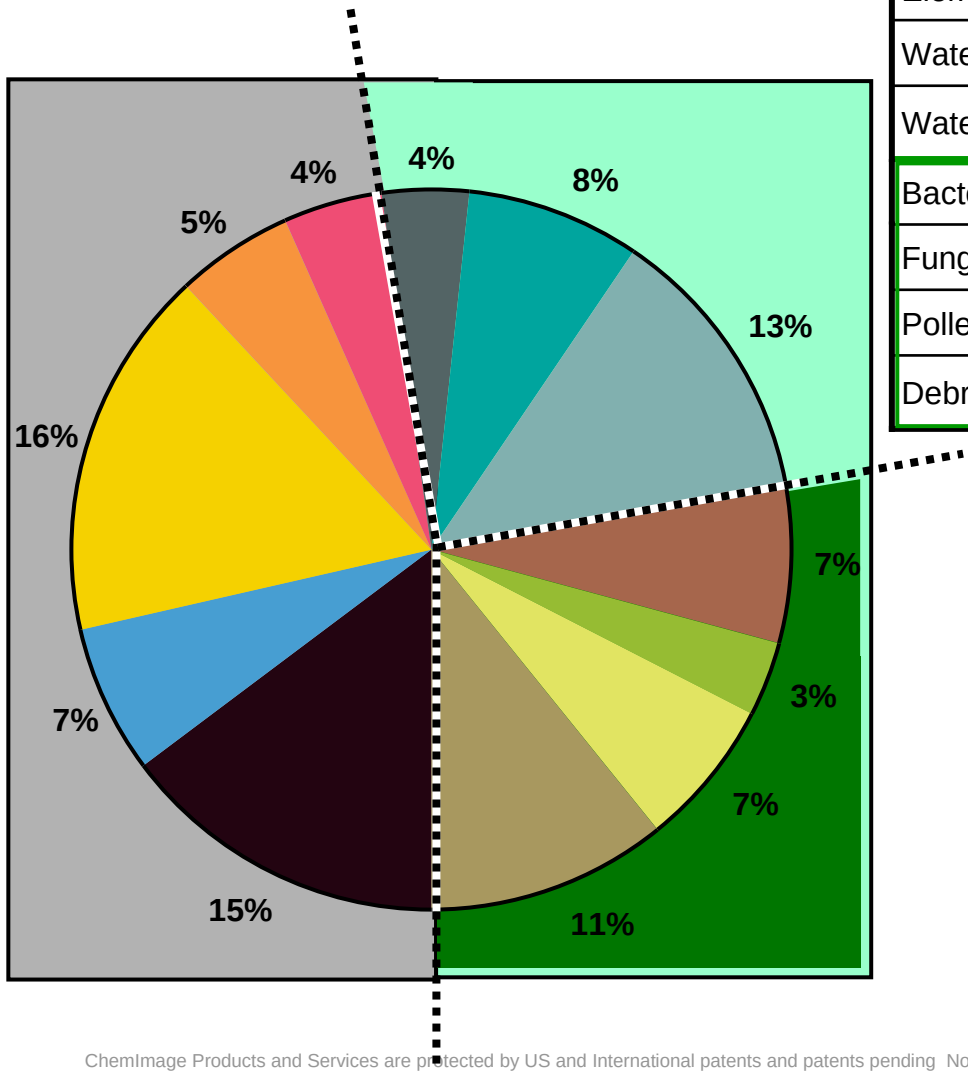
EC– Elemental Carbon
WSOC –Water-soluble Organic Carbon
WINSOC – Water-insoluble Organic Carbon
Debris - Plant and insect parts, Skin flakes, Dander

Figure 10

Task 1.1: Assessment of Knowledge Base

Average Mass Content of Ambient PM

Inorganic Aerosols		47.7%
NO_3^-		4.3%
NH_4^+		5.3%
SO_4^{2-}		16.8%
Sea Salt		6.7%
Mineral Dust		14.6%



Organic Aerosols		52.3%
Elemental Carbon		4.1%
Water Insoluble OC		7.6%
Water Soluble OC		12.6%
Bacteria		7.2%
Fungal Spores		3.2%
Pollen		6.8%
Debris		10.8%

Figure 11

Task 1.1: Assessment of Knowledge Base

Basis for Conclusions - Literature Review (Top 20 out of 98)

1. U.S. EPA Report 600/R-04/058 "Particulate Matter Research Program: Five Years of Progress" July **2004**, *Chapter 5,* 56-58.
2. Air Quality Expert Group. *Particulate Matter in the United Kingdom*. 2nd Report. **2005.**
3. Southern Oxidant Study: Occurrence, Composition, And Sources Of Particulate Matter And Its Precursors. This document is at: http://www.ncsu.edu/sos/v.html
4. Solomon P, et al. Overview of the 1999 Atlanta Supersite project. *J. Geophys. Res.*, **2003**, *108 (D7),* 8413.
5. Turpin BJ, Huntzicker JJ. Identification Of Secondary Organic Aerosol Episodes And Quantification Of Primary And Secondary Organic Aerosol Concentrations During SCAQS. *Atm. Environ.,* **1995**, *29 923,* 3527-3544.
6. Putaud JP, et al. A European Aerosol Phenomenology –2: Chemical Characteristics of particulate matter at kerbside, urban, rural and background sites in Europe. *Atm. Environ.,* **2004**, *38*, 2579-2595.
7. Graber ER, Rudich Y. Atmospheric HULIS: How humic-like are they? A comprehensive and critical review. *Atm. Chem. Phys. Discussions*, **2005**, *5*, 9801-60.
8. McFiggans G, et al. Simplification of the representation of the organic component of atmospheric particulates. *Faraday Discussions*, **2005**, *130*, 341–362.
9. Krivászcy Z. et al. Role of organic and black carbon in the chemical composition of atmospheric aerosol at European background sites. *Atm. Environ*, **2001,** *35*, 6231–6244.
10. Bauer H, Kasper-Giebl A, Loflund M, Giebl H, Hitzenberger R, Zibuschka F, Puxbaum H. The contribution of bacteria and fungal spores to the organic carbon content of cloud water, precipitation and aerosols. *Atm. Res.*, **2002**, *64*, 109-119.
11. Tegen I, Fung I. Contribution To The Atmospheric Mineral Aerosol Load From Land Surface Modification, *J. Geophys. Res.*, **1995**, *100 (18),* 707-18, 726.
12. Batonneau Y, Sobanska S, Laureyns J, Bremard C. Confocal Microprobe Raman Imaging of Urban Tropospheric Aerosol Particles, Submitted to *Environ. Sci. Tech.,* **2005.**
13. Batonneau Y, et al. Speciation of PM_{10} sources of airborne nonferrous metal within 3-km zone of lead/zinc smelters. *Environ. Sci. Tech.,* **2004**, *38* (20), 5281-5289.
14. Kyotani T, Iwatsuki M. Multi-element analysis of environmental samples by X-ray fluorescence spectrometry using a simple thin-layer sample preparation technique. *Analyst*, **1998**, *123*, 1813-16.
15. Nelson MP, et al. Combining Raman Chemical imaging and scanning electron microscopy to characterize ambient particular matter. *Aerosol Sci. Tech.*, **2001**, *34*, 108-117.
16. Zhang Q, Canagaratha MR, Jayne JT, Worsnop DR, Jimenez JL. Time- And Size-Resolved Chemical Composition Of Submicron Particles In Pittsburgh: Implications For Aerosol Sources And Processes. *J. Geophys. Res.*, **2005,** *110*, D07S09, doi:10.1029/2004 JD004649.
17. Matthias-Maser S, Jaenicke R. The Size Distribution Of Primary Biological Aerosol Particles With Radii >0.2 μM In An Urban-Rural Influenced Region. *Atm. Res.*, **1995**, *39*, 279-286.
18. Womiloju TO, Miller JD, Mayer PM, Brook JR. Methods to determine the biological composition of particulate matter collected from outdoor air. *Atm. Environ.*, **2003,** *37*, 4335-4344.
19. Hyvärinen A, et al. Temporal and Spatial Variation of Fungal Concentrations in Indoor Air. *Aerosol Sci. Tech.,* **2001***, 35*, 688-695.
20. Aljoe WW. The DOE-NETL Air Quality Research Program: Airborne Fine Particulate Matter ($PM_{2.5}$). **2002**.

Task 2:
PM Sample Deposition Development

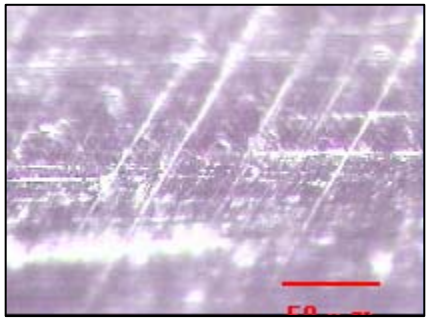
Task 2	PM Sample Deposition Development	Planned	Actual
	Task 2 Completion	**63%**	**50%**
2.1	Investigate properties of system candidate components	100%	100%
2.2	Design Automated Deposition Device (ADD)	100%	100%
2.2.1	Evaluating CI PM collection technology partners	50%	50%
2.2.2	Design Automated Particulate Integrated Collector and Detector (APICD)	50%	30%
2.3	Fabricate & Test ADD and APICD	50%	50%

- During the investigation of system candidate components, a strategic teaming relationship had been developed with a leading manufacturer of PM collectors
  - Collection parameters are being investigated
- ChemImage proposes to incorporate this collector with CI's detection technology to build a prototype Automated Particulate Integrated Collector and Detector
  - Collects airborne PM from air, concentrates and deposits the enriched PM on a substrate
  - An ultrasonic system is under evaluation as a wet deposition sub-system
  - Enriched PM will be analyzed for the presence of threat materials
- Changes to Task 2 and 4 do not impact the project schedule, milestones or the overall project budget
  - Increased resources and labor hours in Task 2
  - Anticipated decrease of labor hours in Task 4.

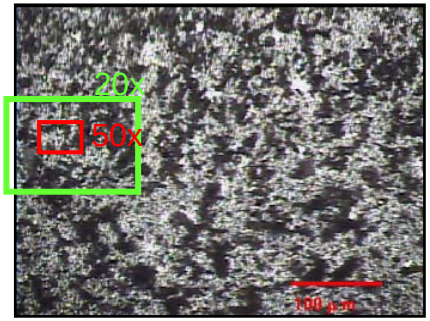
Task 2: Dry Automated Deposition Device (ADD)

Optical Characterization of Deposited PM

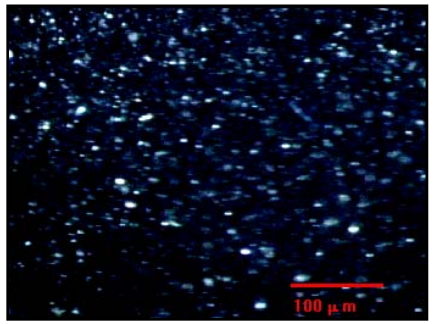
Blank Rod, BFR at 10x



BFR at 10x



FLI at 10x



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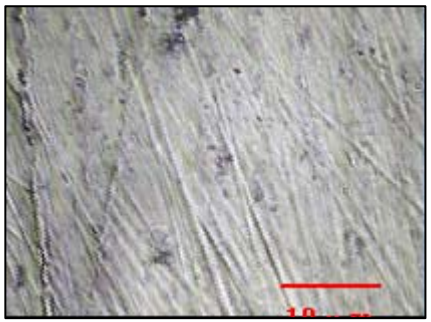
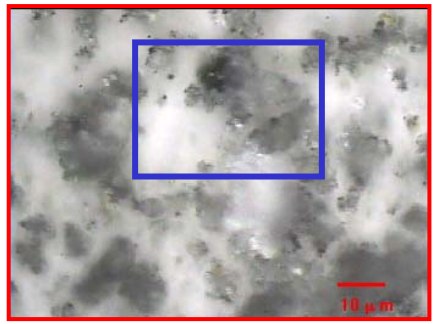
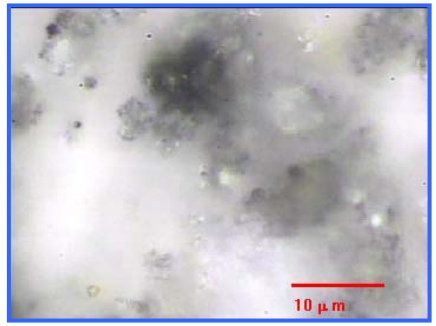


BFR at 50x



BFR at 100x



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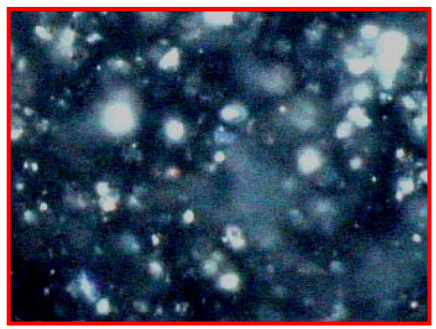
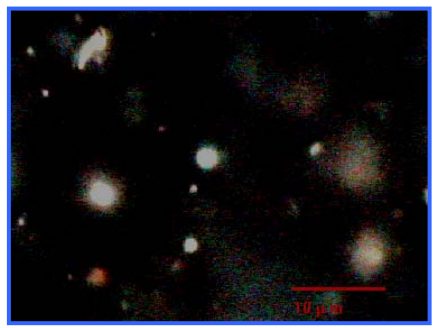


FLI at 100x



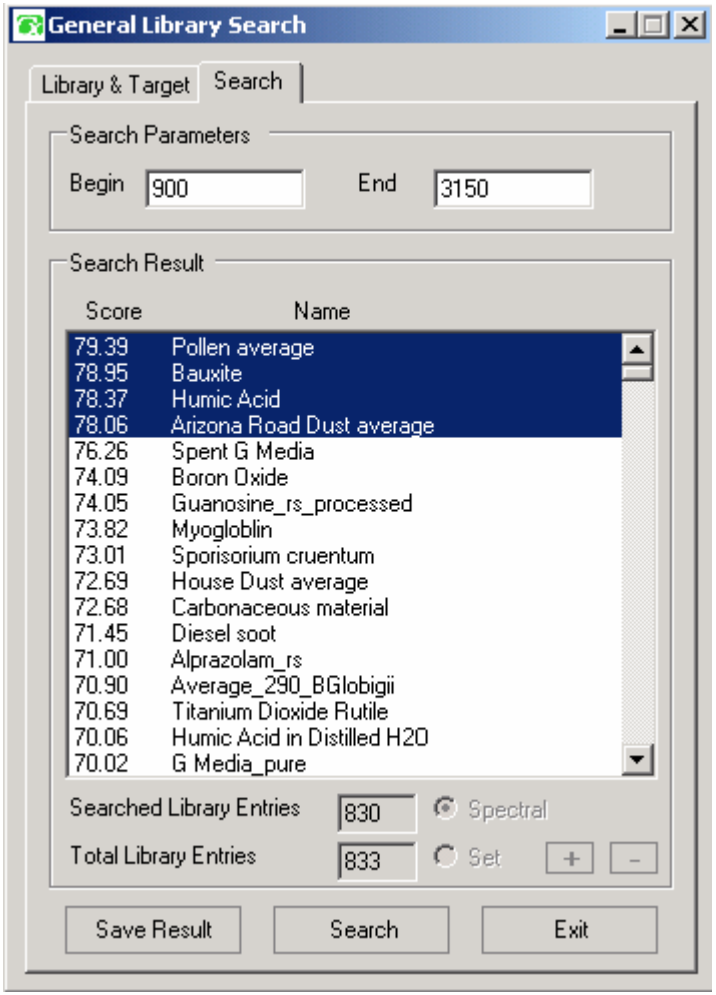
Indoor PM was collected for 72 hrs,

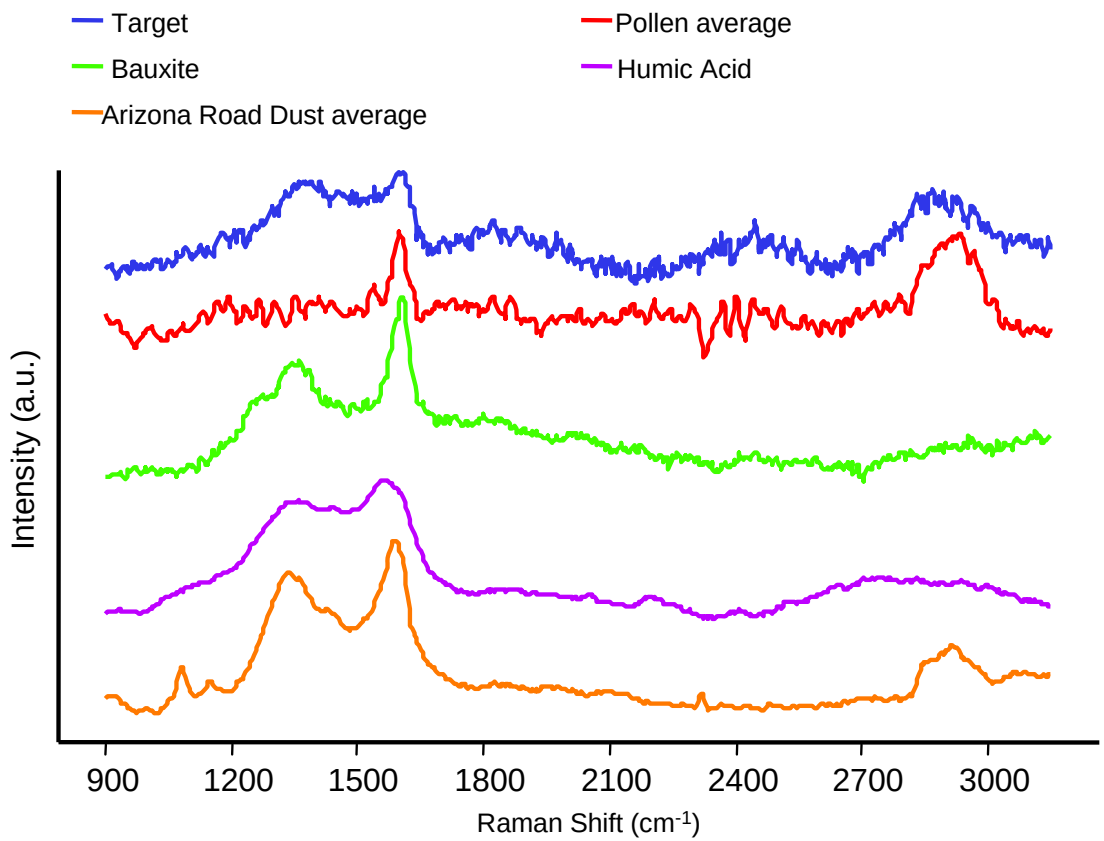
In manufacturing area

Task 2: Dry Automated Deposition Device (ADD)

Raman Identification of Deposited PM

Top Library Hits - Full spectral range





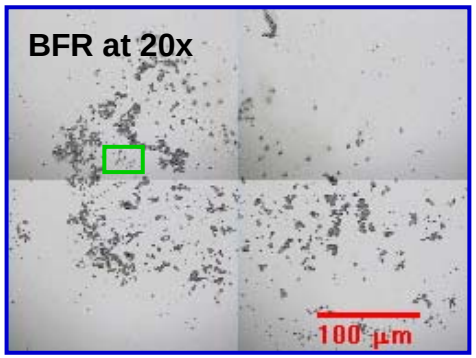
Task 2: Wet Automated Deposition Device (ADD)

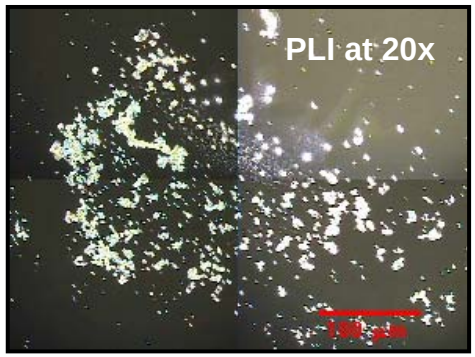
Ultrasonic PM Deposition Device

An automatic system for wet deposition of samples based on ultrasonic sample dispersal

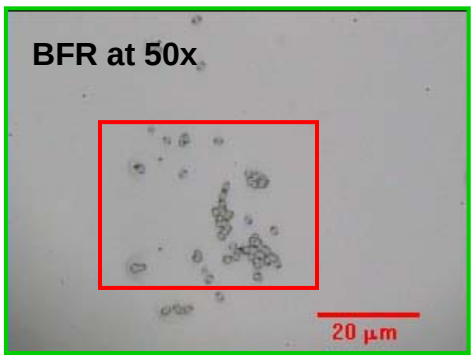
Task 2: Wet Automated Deposition Device (ADD)

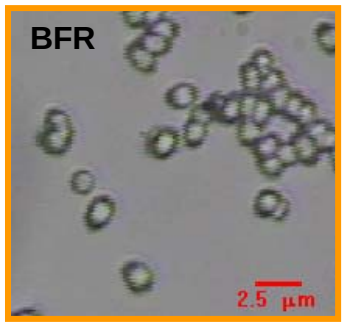
Ultrasonic Deposition of Bg (10^7 PPmL)

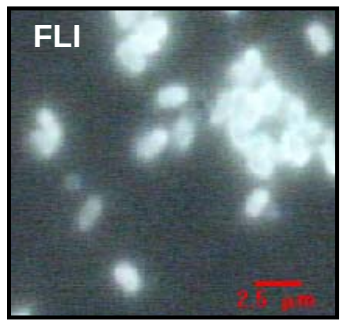


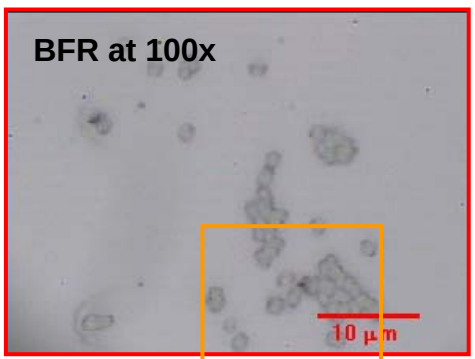


Deposition Method	Demonstrated Minimum Spot Size
Electrostatic	4.8 mm
Aerodynamic	3.0 mm
Inertial Impaction	5.0 mm
Ultrasonic	0.5 mm

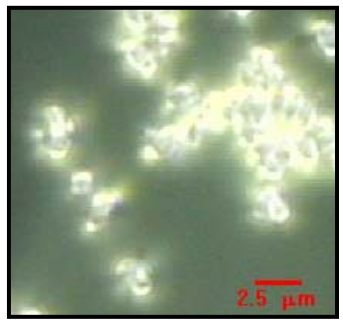




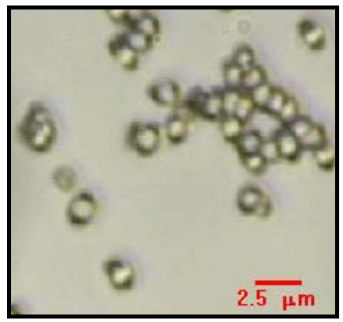




PLI at 100x



DIC at 100x



ChemImage

Tasks 3, 4, 5: Analysis of Reference Samples

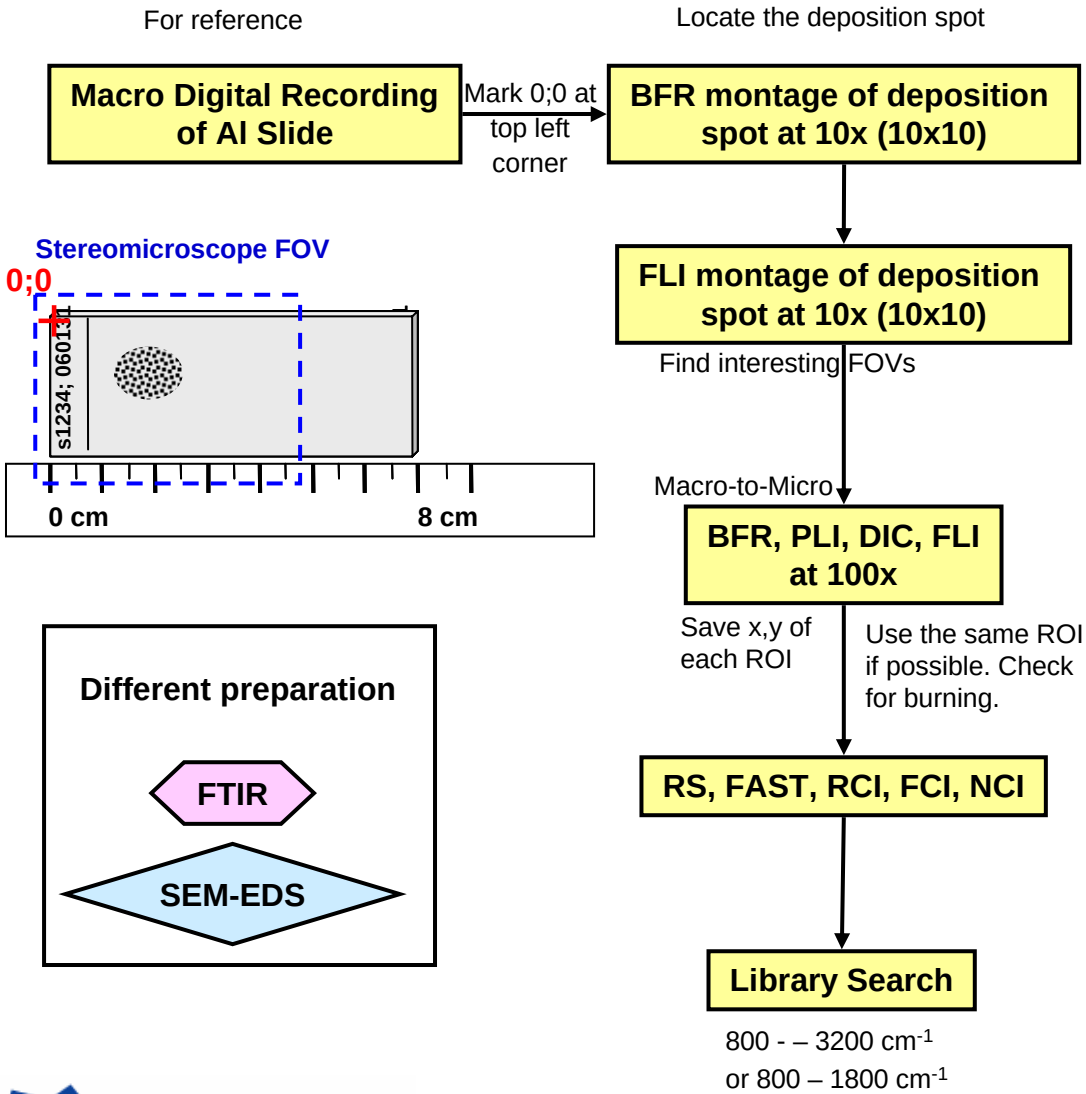
#	Task Description	% Completion	
		Planned	Actual
Task 3	**Collection of Ambient Background Samples**	**50%**	**25%**
3.1	Collect full data sets on pure components – pre-deposition	80%	50%
3.2	Periodic collection of outdoor, ambient airborne particulate	25%	0%
3.3	Periodic Collection of indoor, ambient airborne particulate	25%	25%
Task 4	**Detection**	**50%**	**15%**
4.1	Analyze collected particulate matter (PM)	50%	15%
Task 5	**Signature Database Compilation**	**50%**	**15%**
5.1	Compile a database of signature data sets	50%	50%

Task 3: Collection of Ambient Background Samples

- Collection of new, outdoor PM has been delayed
  - CRADA successfully negotiated with NETL April 7, 2006
- APTA testing protocol has been defined
  - It is being tested for samples collected with ADD
- Indoor ambient particulate matter procured for characterization is being further evaluated
  - NIST Urban Outdoor Dust
  - Greer Labs House Dust: HSARPA RABIS 1A Lot; HSARPA RABIS 1B Lot
  - Dry ADD indoor collections
- In-house reference samples are being evaluated

Task 4: Detection

Experimental Flow for Sample Analysis



Characterization Techniques

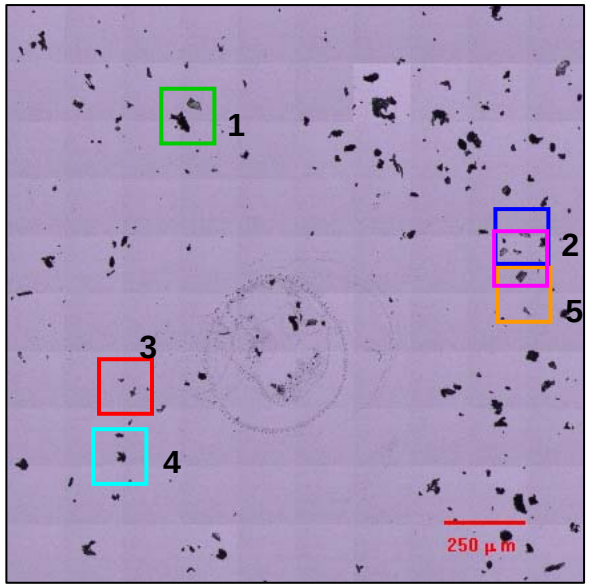
- Optical Microscopy techniques
  - Brightfield Reflectance (BFR)
  - Polarized Light Microscopy (PLI)
  - Differential Interference Contrast (DIC)
  - Autofluorescence Optical Image (FLI)
  - Macro Digital Recording (MDR)
- Spectroscopy techniques
  - Raman Dispersive Spectroscopy (RS)
  - Fourier Transform IR spectroscopy (FTIR)
- Chemical Imaging techniques
  - Raman Chemical Imaging (RCI)
  - NIR Diffuse Reflectance Imaging (NCI)
  - Fluorescence Chemical Imaging (FCI)
- Scanning Electron Microscopy
  - with Energy Dispersive X-Ray Spectroscopy (SEM-EDS)

Task 4: Detection

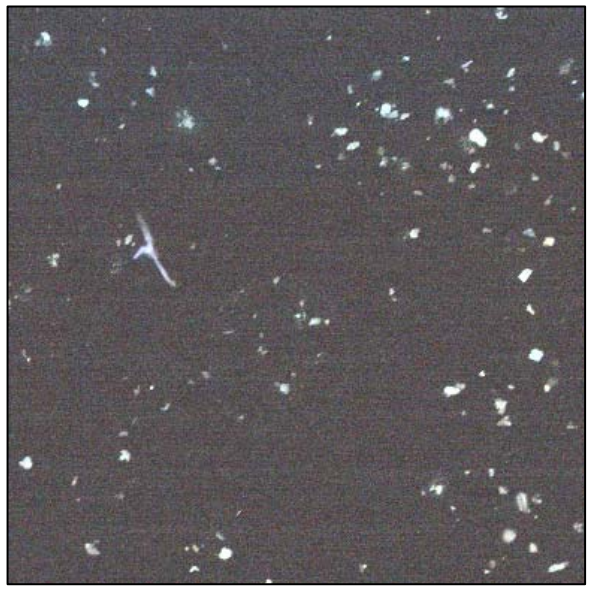
Greer Indoor House Dust s3543 - 10x10 Optical Montage

Total Particles: 278
Particles Studied: 9
Particles Identified: 7

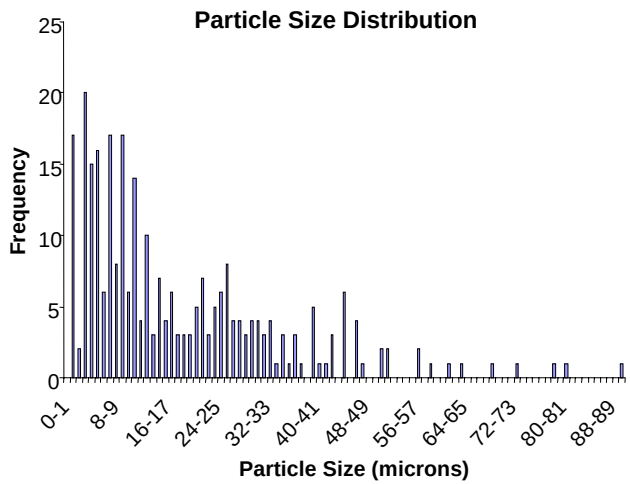
Brightfield Optical Montage



Auto-fluorescence Montage

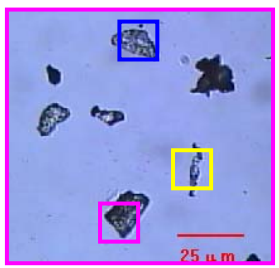


Max Chord (µm): 12.8 median; 18.8 (mean); 16.4 (STD)



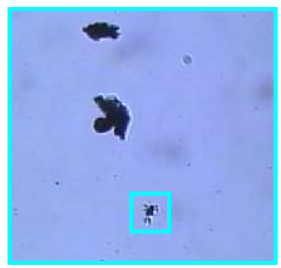
FOV 1

FOV 2, 6, 7

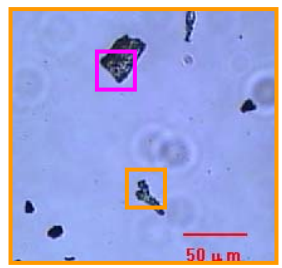


FOV 3

FOV 4



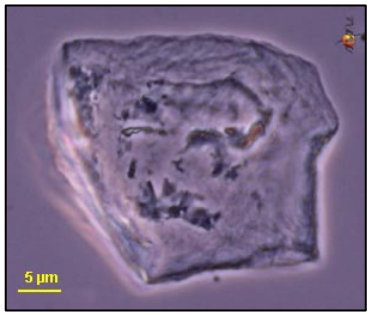
FOV 5, 6



Task 4: Detection

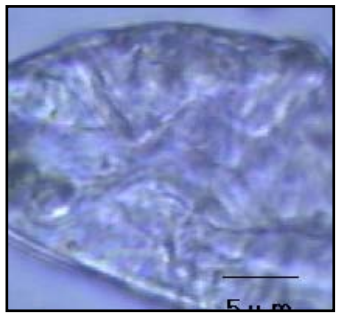
House Dust s3543: Raman Spectrum of Skin Flake (ROI 2)

Reference Human Skin Cell

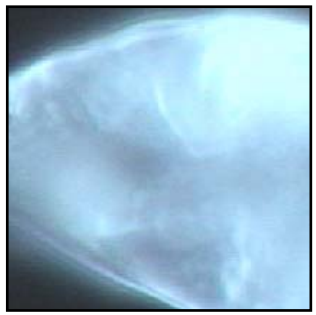


BFR at 50x

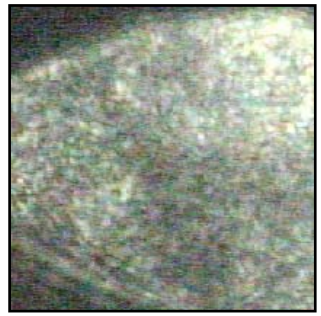
BFR at 100x



FLI at 100x



PLI at 100x



	RS
Laser Wavelength (nm) / Objective / NA	532 / 100x / 0.95
Laser Spot Diameter (µm)	25 µm
Laser Power (mW)/Power Density (W/cm^2)	110 / **6.4x 10^2**
Spectral Resolution	10 cm^{-1}
Time to Photobleach (secs)	180
Integration Time (secs) / # Avgs	8x3
Scanned Region	800-3150 cm^{-1}

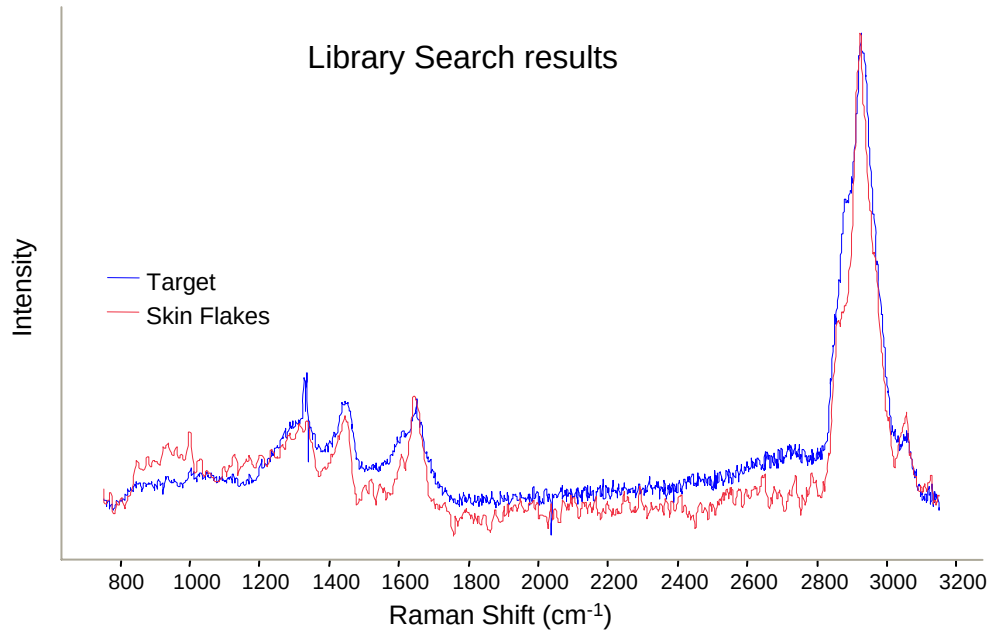
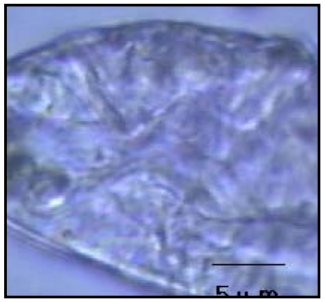


Figure 21

Task 4: Detection

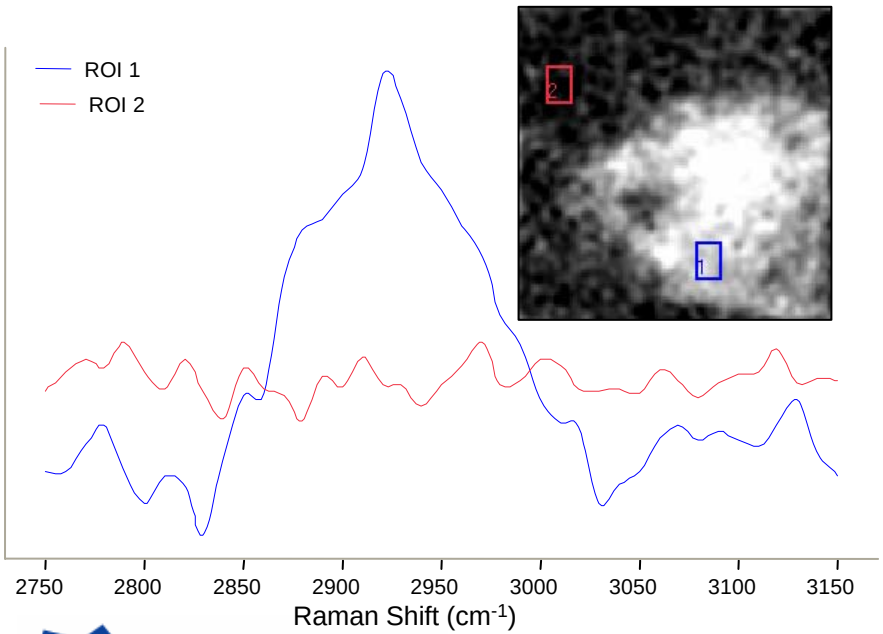
House Dust s3543: Raman Imaging of Skin Flake (ROI 2)

BFR at 100x



Falcon II (Amgen)	RCI	FAST
Laser Wavelength (nm) / Objective / NA	532 / 100x / 0.95	532 / 100x / 0.95
Laser Spot Diameter (μm)	25 μm	25 μm
Laser Power (mW)/Power Density (W/cm^2)	-	110 / **6.4x 10^2**
Spectral Resolution	10 cm^{-1}	10 cm^{-1}
Time to Photobleach (secs)	180	180
Integration Time (secs) / # Avgs	30x1	10x3
Scanned Region	2750-3150 cm^{-1}	800-3150 cm^{-1}
Binning	4x4	-

RCI at 2930 cm^{-1}



FAST at 3100 cm^{-1}

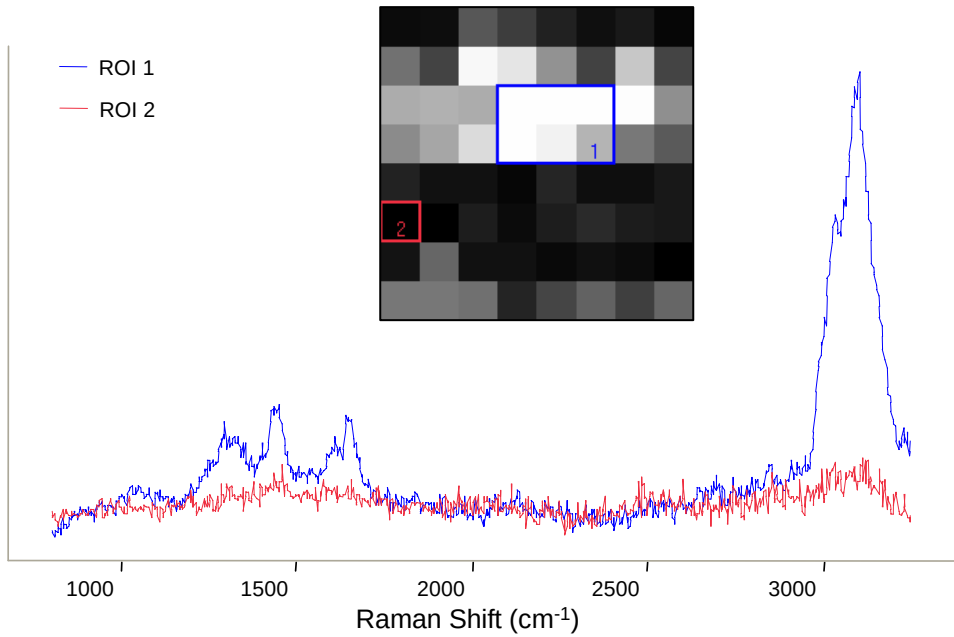
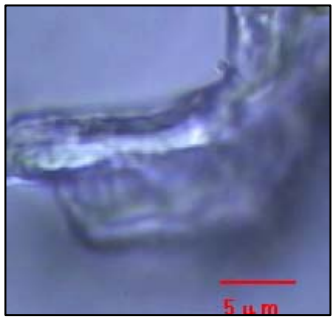


Figure 22

Task 4: Detection

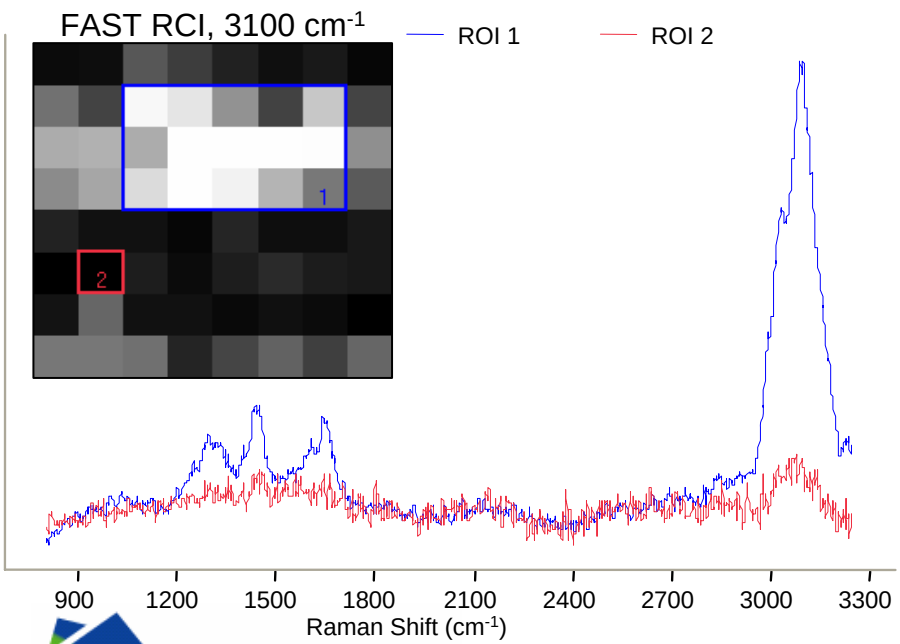
House Dust s3543: Raman Identification of ROI 3 - Pantoea Agglomerans

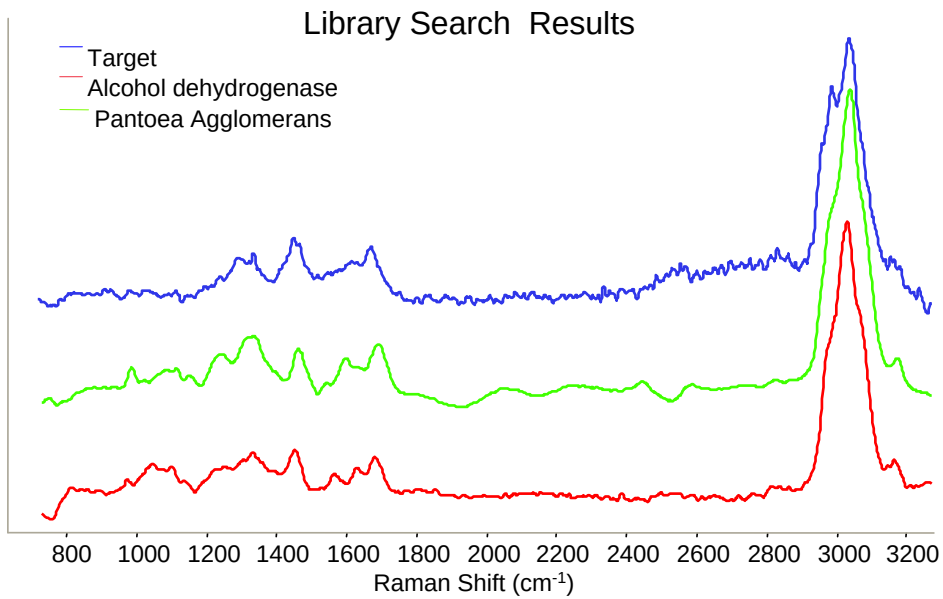
Brightfield Image 100x



Raman Chemical Image

Falcon II (Amgen)	RCI	FAST
Laser Wavelength (nm) / Objective / NA	532 / 100x / 0.95	532 / 100x / 0.95
Laser Spot Diameter (µm)	-	
Laser Power (mW)/Power Density (W/cm^2)	-	110 / **6.4x 10^2**
Spectral Resolution	10 cm^{-1}	10 cm^{-1}
Time to Photobleach (secs)	180	180
Integration Time (secs) / # Avgs	30x1	10x3
Scanned Region	1180-1780 cm^{-1}, 2750-3150 cm^{-1}	800-3150 cm^{-1}
Binning	4x4	





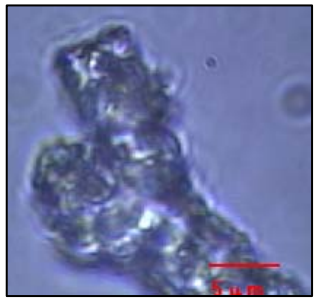
ChemImage

Task 4: Detection

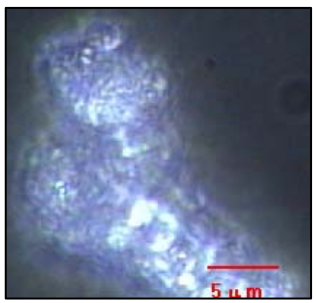
House Dust s3543: Raman Spectroscopy of ROI 5

BFR at 50x

BFR at 100x

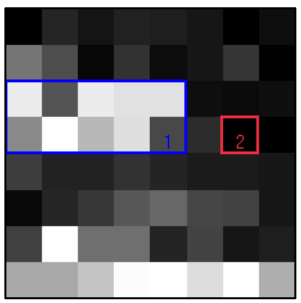


PLI at 100x



FLI at 100x

FAST at 3100 cm^{-1}



No RCI- sample burned

	FAST	RS
Laser Wavelength (nm) / Objective / NA	532 / 100x / 0.95	532 / 100x / 0.95
Laser Spot Diameter (µm)	25 µm	25 µm
Laser Power (mW)/Power Density (W/cm^2)	110 / **6.4x 10^2**	110 / **6.4x 10^2**
Spectral Resolution	10 cm^{-1}	10 cm^{-1}
Time to Photobleach (secs)		
Integration Time (secs) / # Avgs	20x3	10x3
Scanned Region	800-3150 cm^{-1}	800-3150 cm^{-1}

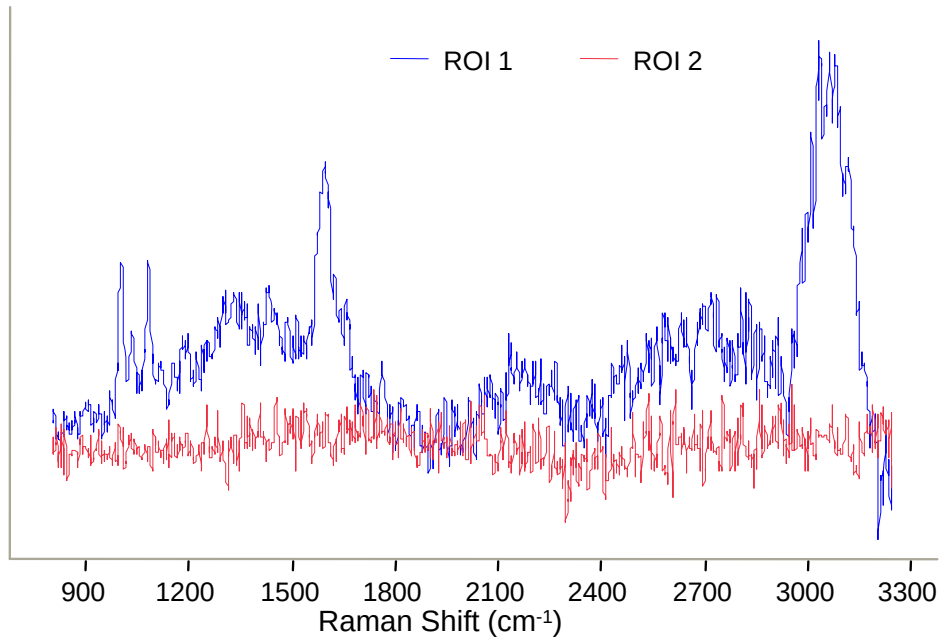


Figure 24

Task 4: Detection

House Dust s3543: Raman Identification of ROI 5 - Pollen

Top Library Hits - Full spectral range

Library & Target | Search

Search Parameters

Begin 751.84 End 3099.26

Search Result

Score	Name
86.71	Pollen average
83.10	Saliva rs
82.55	Spent G Media
80.69	Lysine_processed
78.57	Zinc Selenide Window
78.52	House Dust average
76.94	G Media_pure
76.48	Titanium Dioxide Anatase
76.19	Alprazolam_rs
75.80	Aventurine
75.40	Charcoal
75.07	Micrococcus luteus V_L_ATCC18_NRL 65
75.05	Titanium Dioxide Rutile
74.66	Rock crystal
74.63	Guanosine_rs_processed
74.63	BG S_L_ _NRL 4
74.52	Average_290_BGlobigii

Searched Library Entries 827 Spectral

Total Library Entries 833 Set + -

Save Result | Search | Exit

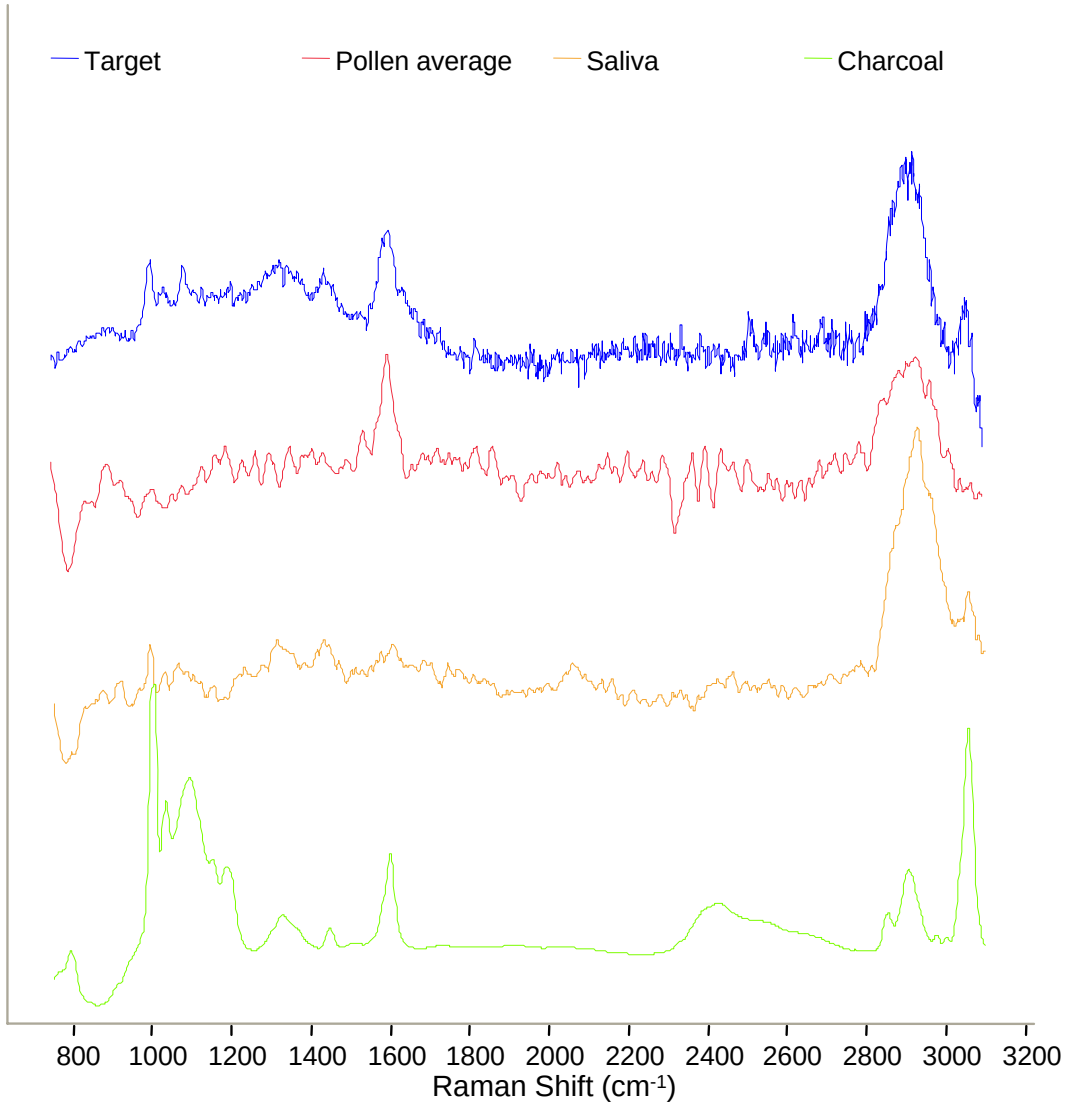


Figure 25

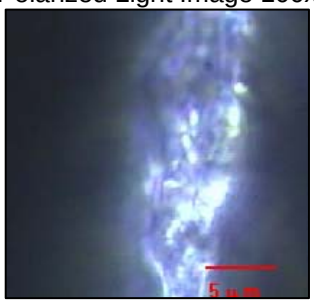
Task 4: Detection

House Dust s3543: Raman Spectroscopy of ROI 7

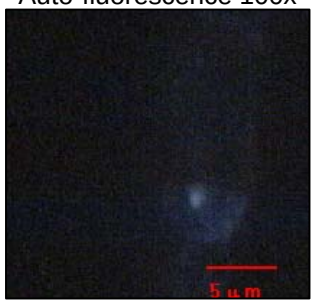
Brightfield Image 50x

Brightfield Image 100x

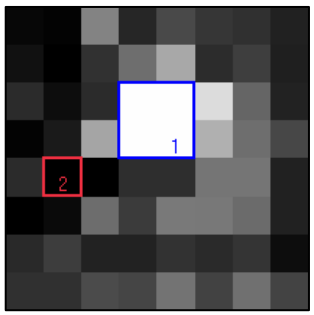
Polarized Light Image 100x

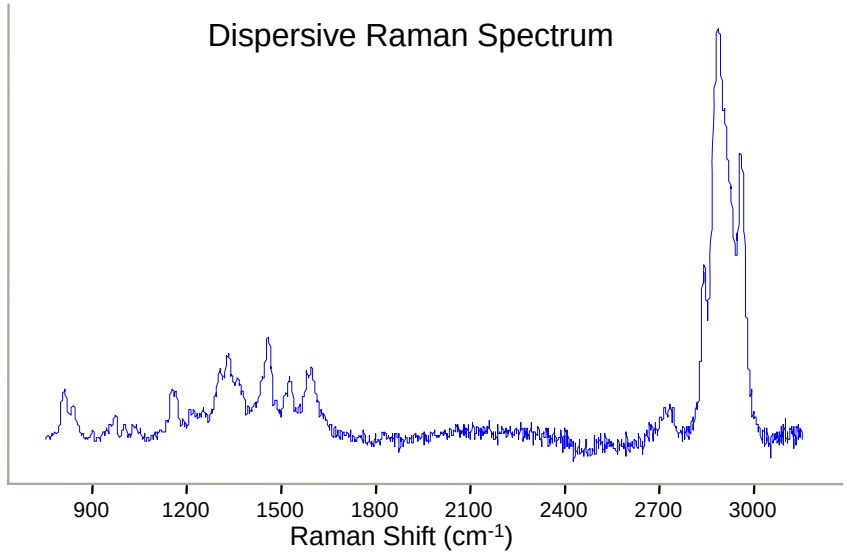


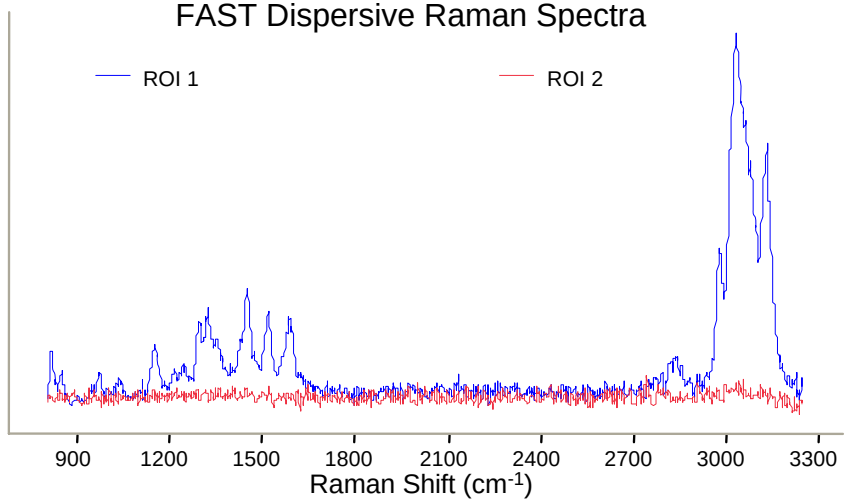
Auto-fluorescence 100x



FAST at 3035 cm^{-1}







Task 4: Detection

House Dust s3543: Raman Identification of ROI 7 - Olefin

Top Library Hits - Full spectral range

Library & Target | Search

Search Parameters

Begin 751.84 End 3151.14

Search Result

Score	Name
88.91	Codeine DB Glucuronide
82.91	Catalase_smoothed
82.79	Olefin
82.68	Chitosan_processed
82.09	Hydroxyethyl cellulose HEC
82.08	Nonoxynol-9
82.04	Tilex_shower_cleaner
81.88	Polypropylene
81.87	2-Octanol
81.85	Top Crest Ultra
81.58	Alcohol dehydrogenase
81.10	Opardy pink
81.06	Brain Heart Infusion
80.96	Dextromethorphan
80.91	Watkins degreaser
80.75	Desipramine
80.30	Polyethylene Glycol

Searched Library Entries 827 Spectral

Total Library Entries 833 Set + -

Save Result | Search | Exit

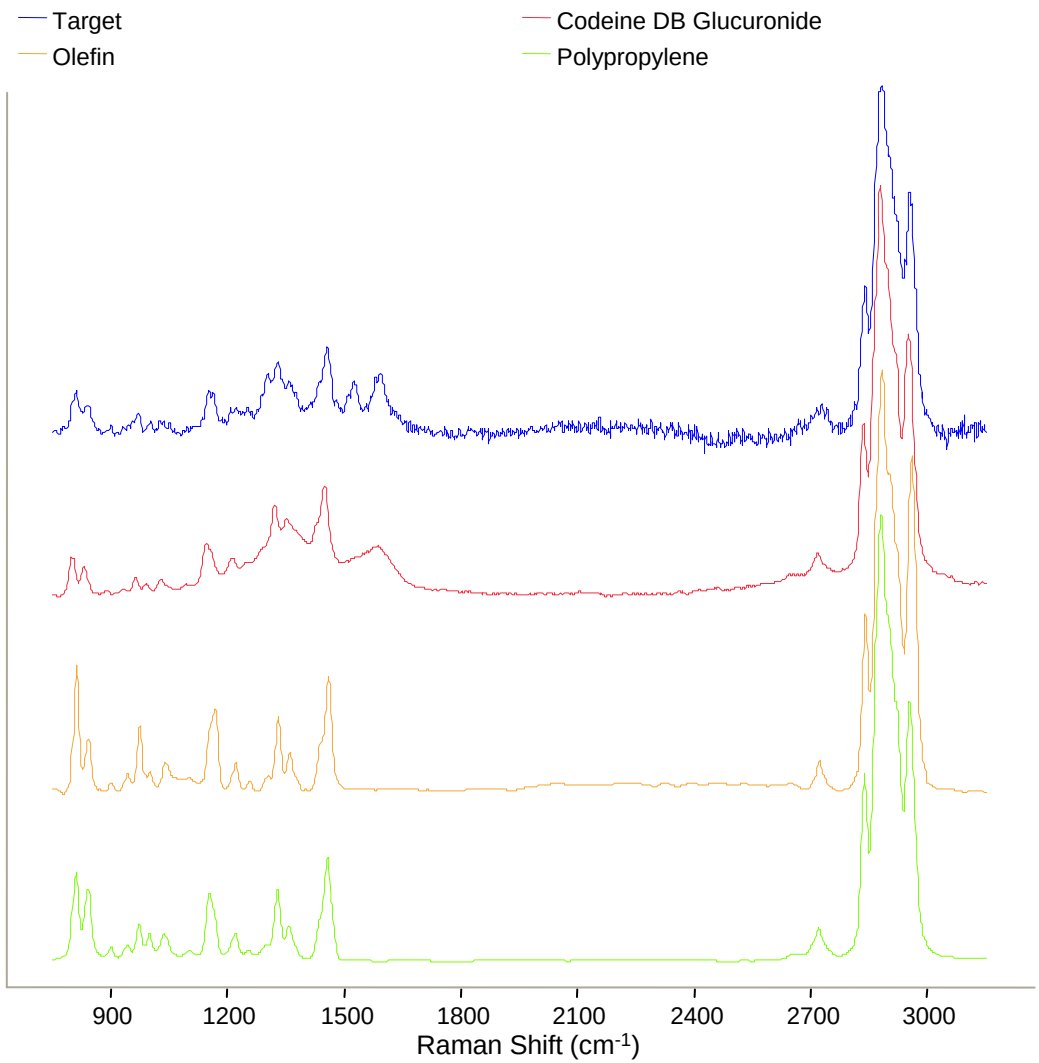


Figure 27

Task 4: Detection

Summary Results - Round 1 PM Identification

Tracking #	Category	Type	ID Method	# Studied	IDed	Class	Type
3543	**Indoor**	**House Dust (non-defatted), Lot 32966, 0.5 g**		**4**	**3**		
	ROI 1	Soot	RS			Organic	**EC**
	ROI 2	? Rare metal oxide	RS			Inorganic	**Min Dust**
	ROI A	Natural polypeptide	FTIR			Organic	**-**
	ROI B	Lignin Cellulose	FTIR			Organic	**WINSOC**
2984	**Indoor**	**House Dust, Lot XPD9-R8-1, 26.0 mg**		**13**	**8**		
	ROI A	Digitalis (foxglove)	FTIR			Biological	**Pollen**
	ROI 1	Humic Acid	RS			Organic	**WSOC**
	ROI 2	Humic Acid	RS			Organic	**WSOC**
	ROI 4	Bg – low S/N	RS			Biological	**Bacteria**
	ROI 5	Bg – low S/N	RS			Biological	**Bacteria**
	ROI 6	Bg – low S/N	RS			Biological	**Bacteria**
	ROI 7	Mixture, possibly mold	RS				
	ROI 10	Humic Acid	RS			Organic	**WSOC**
3556	**Outdoor**	**Urban Dust SRM 1649a**	**NIST**	**10**	**7**		
	ROI 1	Diesel Soot	RS			Organic	**EC**
	ROI 3	Diesel Soot	RS			Organic	**EC**
	ROI 5	Etteringite (calcium sulfoaluminate)	RS			Inorganic	**Min Dust**
	ROI 6	Mixture, soot and etteringite	RS			Org + Inorg	**Min Dust**
	ROI 7	Mixture, possibly soot and thiosulfate	RS			Org + Inorg	**Min Dust**
	ROI 8	Diesel Soot	RS			Organic	**EC**
	ROI 9	Diesel Soot	RS			Organic	**EC**
	ROI 10	Diesel Soot	RS			Organic	**EC**

Task 4: Detection

Summary Results - Round 2 PM Identification

Tracking #	Category	Type	ID Method	# Studied	IDed	Class	
3543	**Indoor**	**House Dust (non-defatted), Lot 32966, 0.5 g**		**9**	**7**		
	ROI 1	Humic acid	RS			Organic	**WSOC**
	ROI 2	Skin Flake	RS			Biological	**Debris**
	ROI 3	Pantoea Agglomerans	RS			Biological	**Bacteria**
	ROI 4	Humic acid	RS			Organic	**WSOC**
	ROI 5	Pollen	RS			Biological	**Pollen**
	ROI 6	Penicillium Chrysogenum (low S/N)	RS			Biological	**Fungi**
	ROI 7	Olefin-containing mixture	RS			Organic	**WINSOC**
3556	**Outdoor**	**Urban Dust SRM 1649a**	**NIST**	**15**	**8**		
	ROI 1	Sporisorium Cruentum	RS			Organic	**Fungi**
	ROI 2	Carbonaceous Material	RS			Organic	**WINSOC**
	ROI 3	Sporisorium Cruentum (low S/N)	RS			Organic	**Fungi**
	ROI 1.1	Carbonaceous Material	FAST			Organic	**EC**
	ROI 3.1	Carbonaceous Material	FAST			Organic	**EC**
	ROI 4	Sporisorium Cruentum (low S/N)	RS			Organic	**Fungi**
	ROI A	Glass	FTIR			Inorganic	**Min Dust**
	ROI B	Cellulose	FTIR			Organic	**WINSOC**

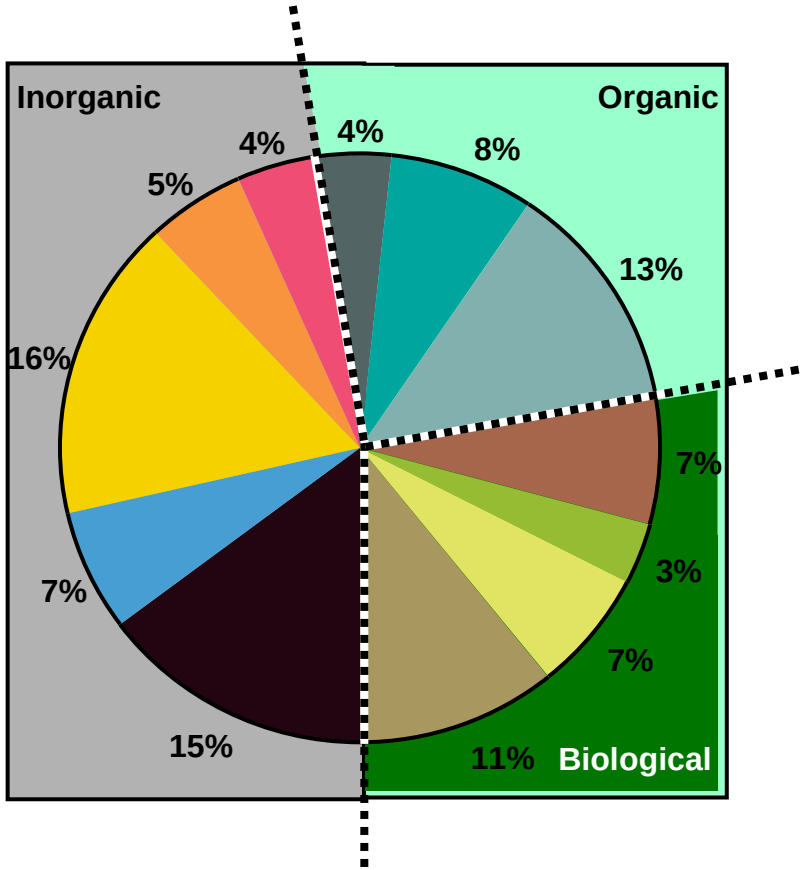
Total Particles Studied in Rounds 1-2: 51

Particles Identified: 33

Task 4: Detection

Summary Results - Classification of Identified PM

Average Mass Content of Ambient PM



		Indoor	Outdoor	Total
NO_3^-		0	0	0
NH_4^+		0	0	0
SO_4^{2-}		0	0	0
Sea Salt		0	0	0
Mineral Dust		1	4	5
EC		1	7	9
WINSOC		2	2	4
WSOC		5	0	5
Bacteria		4	0	4
Fungi		1	3	4
Pollen		2	0	1
Debris		1	0	1
Total		**17**	**16**	**33**

Planned Activities within Q3

(April 1 – July 31, 2006)

- Task 1:
  - Finalize Knowledge Base Assessment for publishing
  - Place NETL subcontract
  - Complete formal particle training
- Task 2:
  - Complete APICD requirements definition and concept design
  - Complete Qualification of the ADD systems
  - Fabricate APICD
- Task 3:
  - Begin training on NETL Dekati sampler
  - Continue ambient PM collections using Dry ADD
  - Develop sampling and deposition protocols
- Task 4:
  - Continue ambient PM evaluations
- Task 5:
  - Continue to compile database